

Cross-sectional study on health professionals' perception of effectiveness in conducting cardiopulmonary resuscitation on adults

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ABSTRACT

Introduction: cardiac arrest is one of the leading causes of death worldwide. Attitudes and practices of healthcare professionals influence survival after cardiac arrest, especially in intensive care units compared to general care units. Maintaining skills and attitudes after cardiopulmonary resuscitation training is challenging and requires systematic refresh with appropriate methodology. The aim is to evaluate healthcare professionals' perception of the effectiveness of cardiopulmonary resuscitation in adults in order to optimize the design of training initiatives focused on addressing identified critical aspects. **Materials and Methods:** a cross-sectional study was conducted on 655 healthcare professionals and technicians who participated in Basic Life Support and Defibrillation (BLS-d) training courses between 2020 and the end of 2022. A questionnaire consisting of 65 variables was administered.

Results: 132 professionals answered. The most critical areas identified are the exclusive role of healthcare professionals in cardiopulmonary resuscitation, the presence of family, confidence in practice, ethical-legal aspects, and teamwork.

Conclusions: the BLS-d course is not able to address parallel aspects such as teamwork, ethical-legal aspects, preconceptions, and issues of self-confidence, which require alternative opportunities and experiences to be defined. The next step of this work will involve the entire team of BLS-d instructors to identify strategies for integrating content.

Key words: attitude of health personnel; cardiopulmonary resuscitation; crew resource management.

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Introduction

Cardiac arrest is one of the leading causes of death worldwide¹ and represents the most critical medical and surgical emergency in hospital settings.² Nurses are often the first to activate the survival chain when a Cardiorespiratory Arrest (CA) occurs.³

Basic life support with the use of a defibrillator (BLS-D) is the standard, easily applicable intervention used to manage CA.^{2,4} Comprehensive knowledge, attitudes, and practices of healthcare providers (particularly nurses and physicians) are crucial to improving patient outcomes (*e.g.*, preventing irreversible organ damage).

The importance of healthcare providers' attitudes and practices has been well established in enhancing survival rates following CA,^{1,2,5} especially in intensive care units compared to general care wards. Therefore, it is essential for them to keep their knowledge and skills up to date.³

However, inadequate knowledge and retention of

Cardiopulmonary Resuscitation (CPR) skills among healthcare providers have been widely documented over the past 20 years.⁶

For instance, studies aimed at examining factors that improve the retention of knowledge and skills during and after CPR training; analyzing the reasons why nurses fail to realistically assess these skills; and evaluating the level of knowledge and attitudes toward CPR among healthcare providers, have shown that a significant number of nurses perform poorly even in hospital areas where CPR is frequently conducted. They are unable to realistically evaluate their abilities, tending to overestimate their knowledge and skills in conducting CPR.^{7,8}

Maintaining skills and attitudes during and after CPR training is challenging and requires systematic refreshers with appropriate methodology.⁵ It has been demonstrated that both skills and attitudes improve with training and workshops, which is why literature emphasizes their maintenance and development.⁸ Additionally, many methods have been designed and evaluated to monitor and improve the long-term retention of these skills.⁶

Table 1. Characteristics of the population.

| | n (% o ±SD) |
|---|----------------|
| Gender (F) | 113 (86) |
| Age | 47,43 (+-8,99) |
| Years of work | 22,6 (+-9,7) |
| Professions | |
| Nurse | 81(61) |
| Midwife | 16 (12) |
| Physician | 14 (11) |
| Technician* | 11 (8) |
| Physiotherapist | 6 (5) |
| Healthcare assistant | 4 (3) |
| Employees working in emergency-urgent care areas (ED, Operating Room, ICU) | 24 (18) |
| Employees working in inpatient areas (medicine, surgery, rehabilitation, outpatient) | 89 (67) |
| Employees working in laboratory and office settings | 19 (14) |
| Year of last BLS-D certification | |
| 2020 | 67 (51) |
| 2021 | 41 (31) |
| 2022 | 24 (18) |
| Professionals who participated actively in resuscitation maneuvers before the last BLS-D course | 61 (46) |
| Professionals who observed without participating before the last BLS-D course | 54 (41) |
| Reasons | |
| Performed other tasks | 18 |
| Resuscitation team was already complete | 36 |
| Professionals who participated actively after the last BLS-D course | 111 (84) |
| Professionals who observed without participating after the last course | 115 (87) |
| Reasons | |
| Performed other tasks | 100 |
| Resuscitation team was already complete | 15 |
| Number of CPRs actively participated in | |
| None | 115 (87) |
| 1 | 9 |
| 2 | 5 |
| More than 3 | 3 |

*Laboratory Technician, Radiology Technician, Neurophysiopathology Technician, Maintenance Technician.

For many years the three-year training plan of a University Hospital in Piedmont provides CPR training courses through BLS-methodology for healthcare workers. Given the large number of employees (over 6000 healthcare providers), this training program requires significant human and economic resources, justifying a monitoring plan for the retention of professional competence on the subject, which is still underdeveloped.

The aim of this study is to evaluate the perception of healthcare providers' effectiveness in conducting CPR on adults, in order to optimize the design of training initiatives focused on addressing the identified critical aspects (e.g., refreshers).

Materials and Methods

Study design, population, and setting

This is a single-center cross-sectional study involving 655 healthcare professionals and technicians who participated in the BLS-D training course between 2020 and the end of 2022. There were no exclusion criteria.

Survey instrument

Based on a literature review, *ad hoc* questionnaire consisting of 63 questions was developed (not previously validated) to assess attitudes toward BLS-D after certification. Initially, 85 survey variables were identified. All variables were translated from English to Italian and back-translated into English by two independent translators. A focus group was conducted with a team of three scientific directors experienced in conducting the BLS-D course with the following objectives: i) to identify variables that can be adapted to the context by applying criteria of specificity, measurability/reliability, and achievability within the set timeframe; ii) to transform the identified variables into statements using criteria of maximum univocity of interpretation; iii) to ensure the identified variables could encompass and evaluate all measurable dimensions.

The final questionnaire (Supplementary materials, Appendix 1) includes 65 variables divided into 19 baseline variables and 46 variables directly related to BLS-D training. The latter investigate the transmission and application of knowledge, attitudes toward intervention, university and curricular training, participation in CPR within a team (team component), and the prejudices, ethical, and legal values of the professional (subjective background).

Questionnaire testing

The questionnaire was tested by 20 professionals (excluded from the convenience sample) to assess comprehension and completion time and by 8 BLS-D instructors to evaluate the relevance and understanding of the variables. No modifications or integrations were deemed necessary to improve the relevance and comprehension of the statements after the tests.

Questionnaire administration

The questionnaire was administered via the free-to-use Google Forms web platform and sent to the participants' corporate email addresses between August and October 2022.

Questionnaire completion

The 19 baseline variables were investigated through multiple-choice questions. The 46 variables directly related to BLS-D training were measured using a 10-point Likert scale to assess the degree of agreement/disagreement with the statements.

Data analysis

The researchers were not directly involved in recruitment. The stratification criteria for the Likert scale results were: 0-3 disagreement; 4-5 low agreement; 6-7 moderate agreement; 8-10 agreement. Anonymized data were analyzed and subsequently represented using absolute and relative frequency and measures of central tendency and dispersion (mean and standard deviation).

Ethical considerations

The importance of the study was explained to the participants in the introductory email for the questionnaire, which described the voluntary nature of participation, the study's purpose, and that the collected data would be processed in aggregated form ensuring anonymity. Consent to participate was thus implicitly obtained prior to completing the questionnaire.

Results

Of the 655 professionals included, 132 (20%) responded to the questionnaire. Table 1 describes the baseline characteristics of the respondents. The most represented categories within the baseline variables are: belonging to the nurse/midwife category, working in general wards, having obtained BLS-D certification in 2020, lacking ILS/ALS/ACLS certifications, and having never or almost never participated in or witnessed cardiopulmonary resuscitation in a real context.

Table 2 illustrates the percentage of respondents in disagreement/low agreement (i.e., not feeling capable of) with the following skills acquired after the course, organized into the following categories.

Table 3 shows the agreement related to statements on subjective background variables.

Regardless of the results, 98% of respondents believe that the presence of BLS-D in university and curricular training is important.

Table 4 describes responses that deviate by a value $\geq 30\%$ in terms of agreement/disagreement with the statement.

The most critical areas identified in the questionnaire are: the exclusive role of healthcare personnel in CPR, the presence of family, confidence in practice, ethical-legal aspects, and teamwork.

Table 2. Acquired skills.

| | % Disagreement/low agreement |
|---------------------------------|------------------------------|
| Application of knowledge | |
| Recognizing Cardiac Arrest (CA) | 11 |
| BLS-D sequence | 11 |
| Pulmonary ventilations | 12 |
| Chest compressions | 13 |
| Use of AED | 10 |
| Willingness to intervene | |
| During a CA | 17 |
| Use of AED | 17 |
| Participation in teamwork | |
| As a member | 30 |
| As a leader | 39 |

Discussion

The aim of this study is to evaluate the perceptions of health-care professionals who attended BLS-D courses regarding their effectiveness in conducting adult CPR. The results obtained will be useful for improving the content of training courses on the topic or for designing additional supplementary tools for further exploration.

The respondent sample consists of female participants (86%) with an average of 23 years of work experience. The most represented profiles are Nurses (61%) and Midwives (12%). Sixty-seven percent work in general wards or outpatient clinics; 18% in emergency/urgent care. Fifty-one percent obtained BLS-D certification in 2020.

Data analysis, conducted on variables organized according to the presented categories, allowed for describing the degree of agreement/disagreement of the professionals with the statements in the questionnaire, comparing them with experiences described in the literature. Some categories emerged as fairly consistent, while others differed significantly.

Regarding the transmission of knowledge (Table 2), in our experience, 11% of respondents do not feel capable of recognizing a CA. Saquib *et al.* and Mersha *et al.*^{2,4} in two studies on 698 and 406 healthcare professionals respectively, found that 15% and 8% faced the same issue. Saquib *et al.* also did not find significant differences between the included professional profiles. In Abebe *et al.*,¹ among 324 healthcare professionals who had not attended CPR training courses, these percentages increased significantly

Table 3. Subjective Background.

| | % accordo |
|--|-----------|
| Family | |
| Discomfort in the presence of family during CA | 64 |
| Hesitation to initiate CPR | 24 |
| Additional motivation to start CPR in the presence of family members | 40 |
| Self-Confidence / Acquired Experience | |
| Hesitation to initiate CPR | 31 |
| Poor competence in CPR among Italian professionals | 58 |
| Lack of experience can cause hesitation in performing CPR despite BLS-D training | 47 |
| Knowing the victim of CA makes it difficult to initiate CPR | 9 |
| Ethical and Legal Considerations | |
| Obligation to perform CPR for ethical reasons | 68 |
| Obligation to perform CPR for legal reasons | 63 |
| Awareness of legislation regarding CPR and AED use | 70 |
| Fear of medico-legal consequences | 24 |
| Prejudices (Non-recognition of layperson utility) | |
| Any citizen should be able to perform CPR | 86 |
| Any citizen should be able to use an AED | 89 |
| CPR should only be performed by healthcare professionals | 27 |
| Prejudices | |
| I am opposed to performing CPR in case of CA | 13 |
| Healthcare professionals in Italy are not competent in CPR | 58 |
| AED damages the patient's heart | 16 |
| Post-CPR prognosis is always unfavorable | 11 |
| Lack of sufficient experience causes hesitation to initiate CPR | 46 |
| Indications for resuscitation | |
| Identification of patients for whom CPR is not appropriate | 89 |
| Patient information that leads to early termination or non-initiation of CPR | 78 |

Table 4. Agreement/disagreement with the statements.

| | % | Agreement/ disagreement |
|--|----|-------------------------|
| Subjective background | | |
| Semi-automatic defibrillation should be performed exclusively by healthcare professionals | 33 | agreement |
| The presence of family members during a cardiac arrest causes me discomfort | 64 | agreement |
| The presence of family members during a cardiac arrest is an additional incentive to initiate CPR early | 40 | agreement |
| Healthcare professionals in Italy are not sufficiently competent in CPR | 58 | agreement |
| Lack of confidence in myself may cause hesitation to initiate CPR | 31 | agreement |
| Although I attended the BLS-D course, lack of sufficient experience may cause hesitation to initiate CPR | 47 | agreement |
| Obligation to perform CPR for ethical reasons | 68 | agreement |
| Obligation to perform CPR for legal reasons | 63 | agreement |
| Awareness of legislation regarding CPR and the use of AED | 30 | disagreement |
| Team member | | |
| I feel capable of working as a member of the CPR team | 30 | disagreement |
| I would feel confident leading the CPR team | 39 | disagreement |

(73%), aligning with results in the literature,^{3,5,8,9} where a statistically significant relationship was found between better performance scores and a better attitude in professionals with prior resuscitation training and more work experience.

With regard to the ability to apply knowledge, the experience of Mersha *et al.* aligns with the results of this study (13%) concerning the perception of correct chest compression execution. It differs, however, in ventilation technique, showing a negative perception of 36% vs. 12%.

Concerning the attitude towards participating in CPR as part of a team, Abolfotouh *et al.* found that among 321 healthcare professionals who had attended a BLS-D course, 40% did not feel capable of working in a team. In this study, we explored this ability, finding that a portion of participants did not feel capable of working either as a team member (30%) or as a team leader (39%). These similar data in the two studies could be explained by the fact that the course duration (on average 6 hours) does not allow for adequately developing such a complex competence, which requires specific training experiences aimed at managing teamwork. Gonzalez *et al.* investigated how the level of theoretical and practical understanding of 347 nurses influences their attitudes towards bioethical issues. In this study, the presence of family members influences the decision to initiate CPR in 52% of the nurses. In our experience, 64% of respondents (Table 3) reported the same issue, and 24% hesitated to start CPR in the presence of family members.

Regarding prejudices and indications for resuscitation, the study results are partially in agreement with Abolfotouh *et al.* and Tiscar-González *et al.* In agreement with Abolfotouh *et al.*, participants believe that the post-CPR prognosis is always adverse (11%), while in this study, the percentage of professionals who believe that the AED harms the patient's heart is significantly higher (16%) compared to Abolfotouh *et al.* (3%). This difference could be attributed to the greater heterogeneity of the sample in our study.

Consistent with Tiscar-González *et al.*, professionals believe it is necessary to identify patients for whom CPR is not appropriate, and that such information may lead to not initiating or prematurely stopping CPR.

The variables that most deviated from expectations, as highlighted in Table 4, were further analyzed with the three scientific directors experienced in conducting the BLS-D course (blinded to the initial analysis) to identify and guide training strategies that could improve attitudes towards CPR.

Several authors emphasize how the BLS-D course positively influences knowledge, technical skills, and attitudes towards CPR.^{3,5,8,9} Even after six months from the last training, there is a significant decline in BLS-D knowledge,^{1,4} which is also evident from the results of this study, where participants from the 2020 course showed greater deviations from expectations compared to later editions.

The literature suggests that resuscitation training should be conducted every 3 to 6 months to prevent the deterioration of acquired skills.^{1,3-6,8} Course refreshers are positively perceived by most professionals;⁴ indeed, 98% of respondents consider BLS-D training strategic in university and professional curricula.

However, due to staffing and financial issues, proposing retraining is challenging. In light of these problems, Hamilton⁶ suggests using other more flexible teaching methodologies within the workplace, such as using mannequins with feedback mechanisms capable of simulating critical deteriorations, self-training videos, peer training, and cardiac arrest simulations.

The results of this study should be interpreted in light of some potential limitations. The sample recruited was convenient, and the

response rate was 20%, which could have introduced a sampling bias. Additionally, during the analysis phase, some potential inconsistencies were found in the responses to five questions, suggesting the presence of an interpretive bias not identified during testing. Nevertheless, this work contributes to identifying specific areas of criticality that are still under-investigated in the Italian context.

Conclusions

Our study reveals that the highly standardized and technically focused BLS-D course does not adequately address parallel aspects such as teamwork, ethical-legal issues, prejudices, and self-confidence problems, which require alternative opportunities and experiences to be defined. The continuation of this work involves engaging the entire team of corporate BLS-D instructors to identify alternative strategies for content integration.

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Conflict of interest: the authors declare no potential conflict of interest, and all authors confirm accuracy.

Ethics approval: the approval of the Ethics Committee was not sought as the study falls within the scope of the impact assessment of the company's training activities, which are institutionally planned and approved annually by the Technical-Scientific Committee during the validation of the annual training plan. This study complies with the principles set out in the 1964 Declaration of Helsinki, revised in 2013. The participants involved in this study provided their consent to participate.

Informed consent and participants consent for publication: the importance of the study was explained to the participants in the introductory email accompanying the questionnaire, which described the voluntary nature of participation, the study's purpose, and the aggregated handling of the collected data to ensure anonymity. Free and voluntary consent to participate was therefore implicitly obtained before the completion of the questionnaire, as required by the Declaration of Helsinki.

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